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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/720,597

11/24/2003

Yiliang Wu

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06/21/2005

PATENT DOCUMENTATION CENTER
XEROX CORPORATION
100 CLINTON AVE., SOUTH, XEROX SQUARE, 20TH FLOOR
ROCHESTER, NY 14644

EXAMINER

SMOOT, STEPHEN W

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 06/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

ER

Office Action Summary

Application No.

10/720,597

Applicant(s)

WU ET AL.

Examiner

Stephen W. Smoot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4-25-05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This Office action is in response to applicant's amendment received on 25 April 2005.

Response to Arguments

1. Applicant's arguments, see paragraph bridging pages 5 and 6, received 25 April 2005, with respect to the rejections of claims 1-15, under 35 USC 102(b) and under 35 USC 102(e), have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, new grounds of rejection are made in view of Friend et al. (WO 99/54936 A1) as indicated below.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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3. Claims 1-3, 5-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Friend et al. (WO 99/54936 A1).

Referring to Figs. 13-18 and page 20, second full paragraph, Friend et al. disclose various thin film transistor structures with the following features:

- A transistor active region (53) in contact with a gate insulator layer (54);
- A gate electrode (56) in contact with the gate insulator layer (54);
- A source electrode (52) and a drain electrode (51) both in contact with the transistor active region (53);
- The transistor active region (53) is a semiconductor layer of a conjugated polymer and, more specifically, can be regioregular poly-hexylthiophene (P3HT) (also see page 1, second paragraph and the paragraph bridging pages 10-11);
- Solvents in which P3HT tend to self-organize as aggregates can be used to improve the ordering of the as-formed P3HT layer (also see paragraph bridging pages 12 and 13);
- Chloroform can be used as a solvent to encourage the formation of P3HT aggregates and the resulting solution can be spin coated at room temperature onto a substrate to deposit a layer of P3HT with a final thickness of 500 angstroms (i.e. 50 nm) (also see paragraph bridging pages 12 and 13, and paragraph bridging pages 18 and 19);
- The source and drain electrodes can have a thickness that ranges from 500 to 1000 angstroms (i.e. 50 to 100 nm) (also see page 13, second full paragraph);

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- The gate insulator layer can be an inorganic material (e.g. silicon dioxide) or an organic polymer (e.g. PMMA) (also see page 11, first full paragraph and paragraph bridging pages 16 and 17); and
- The transistors have mobilities that range from 0.05 to 0.1 cm²/Vs and bulk conductivities that are less than 10⁻⁸S/cm (also see page 15, first full paragraph);
- The transistors have ON-OFF ratios of 10⁶ to 10⁸.

These are all of the structural limitations set forth in claims 1-3, 6-14 of the applicant's invention. Regarding the capable of gelling limitation of claim 1, this is property limitation that is presumed to be inherent to the field effect transistor of Friend et al. because its structure is substantially identical to the applicant's structure as claimed in claims 1-3, 5-14. Per MPEP section 2112.01, a *prima facie* case of anticipation has been established and the burden shifts to the applicant to show that the structures are not identical. Regarding the aggregate size limitation of claim 5, this is a product-by-process limitation that is directed to the method of production, itself, and does not appear to be structurally distinguishable from the prior art of Friend et al. Per MPEP section 2113, the burden shifts to the applicant to show an unobvious difference between their product as claimed in claim 5 and the field effect transistor of Friend et al.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend et al. (WO 99/54936 A1) as applied to claim 1 above, and further in view of Tsumura et al. (US 5,500,537 – reference cited in prior Office action mailed to applicant on 21 January 2005).

As shown above, Friend et al. anticipate claim 1 of the applicant's invention. However, Friend et al. lack the further limitation to claim 1 as set forth in claim 4, which is a self-organizable polymer that includes two polymers. Tsumura et al. teach a field effect transistor with an organic semiconductor layer (8 in Fig. 4) that can be a π -conjugated block copolymer of at least two types of monomers, including polythiophene (see column 7, line 36 to column 8, line 30).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Friend et al. and Tsumura et al. in order to substitute a π -conjugated block copolymer, as taught by Tsumura et al., for the P3HT layer of Friend et al. Tsumura et al. recognize that the use of a π -conjugated block copolymer has the advantage of a greatly increased source-drain current without increased leakage (see column 10, lines 29-45).

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Friend et al. (WO 99/54936 A1) as applied to claim 1 above, and further in view of Ong et al. (US

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6,770,904 B2 – reference cited in prior Office action mailed to applicant on 21 January 2005).

The applied reference of Ong et al. (US 6,770,904 B2) has common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention “by another”; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

As shown above, Friend et al. anticipate claim 1 of the applicant's invention. However, Friend et al. lack the further limitation to claim 1 as set forth in claim 15, which is a self-organizable polythiophene selected from the group as set forth in claim 15 and where n ranges from about 5 to about 5000. Ong et al. (US 6,770,904 B2) teach a field

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effect transistor with a polythiophene semiconductor layer (12 in Fig. 1) that can be formula (II-c) (see the top of column 5), which is the same as formula (9) from applicant's claim 15, and where n can range from 50 to about 3000 (also see column 16, lines 35-38).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Friend et al. and Ong et al. (US 6,770,904 B2) in order to substitute the polythiophene formula (II-c) of Ong et al. (US 6,770,904 B2) for the P3HT layer of Friend et al. Ong et al. (US 6,770,904 B2) recognize that their various polythiophene formulations, including formula (II-c), have improved stability in ambient conditions (see column 7, lines 4-8).

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

A handwritten signature in black ink that reads "Stephen W. Smoot". The signature is written in a cursive, flowing style.

Patent Examiner
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